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GOST 3337-46

(Petroleum Industry E27)

DETERMINATION OF AVIATION-GASOLINE OCTANE RATINGS BY THE 1-C PROCESS

/Figures and graphs are appended/

This standard determines the detonation stability - expressed in octane ratings - of aviation gasolines by the 1-C process.

The octane rating so determined is numerically equal to the percentage by volume of isooctane (2,2,4-trimethylpentane) in a mixture of isooctane and normal heptane. The detonation stability of this mixture is equivalent to that of the tested fuel during an experimental comparison of the two.

For fuels having a greater detonation stability than isooctane, the detonation stability is expressed as an arbitrary (extrapolated) octane rating.

Octane rating as determined by the 1-C process is designated as follows: O. R./1-C; for example, 95/1-C.

I. APPARATUS

1. To determine the detonation stability of fuels, use the set-up described in the supplement.

II. CALIBRATING FUELS

2. Primary Calibrating Fuels

The following are to be used as primary calibrating fuels:

a) Normal heptane

b) Isooctane (2,2,4-trimethylpentane)

c) Isooctane with an admixture of tetraethyl lead in the form of ethyl liquid R-9 (GOST 988-44)

Normal heptane and isooctane must correspond to GOST 511-41 (Replaced by the All-Union State Standard 511-46).

3. Secondary Calibrating Fuels

For secondary calibrating fuels the following are recommended:

a) Technical isooctane (TI) with an octane rating of 92-93 as determined by the motor process

b) Aviation gasoline directly distilled from Baku oil B-70 GOST 1012-44 (Replaced by the All-Union State Standard 1012-46)

c) Technical isooctane with a 3 milliliters per kilogram of R-9 (3 TI)

d) Gasoline B-70 with a 3 milliliters per kilogram admixture of R-9 (3B-70)

4. To determine the explosive stability of fuels having octane ratings less than 90, use fuels specified in subparagraphs (a) and (b).

For similar determinations involving fuels with octane ratings in excess of 90, employ fuels specified in subparagraphs (c) and (d).

To insure greater experimental yield, each batch of secondary calibrating fuels and their pure mixtures as well as those with 3 milliliters per kilogram of R-9 added must be calibrated against the primary calibrating fuels in no less than five laboratories.

Averaged results of the calibration should then be arranged in a table or a graph showing transfer from the secondary calibrating fuels to the primary. This is to be attached to the results obtained with secondary calibrating fuels.

Note: It is permissible to use the U. S. secondary calibrating fuels S+M and S+ tetraethyl lead [redacted].

III. PREPARATIONS FOR THE TEST

5. In testing fuels, the following engine operating conditions are to be observed:

a) Revolutions per minute, 1200±12.

b) Constant spark advance, 35±1 degree to top dead center for all degrees of compression

c) Valve clearances of a cold engine:

Intake valve, 0.2 millimeters (0.008 inches)

Exhaust valve, 0.25 millimeters (0.01 inches)

d) Coolant temperature, 190±5 degrees Centigrade (374±9 degrees Fahrenheit), which is measured by a thermometer inserted into the cylinder drain pipe.

e) Coolant, ethylene glycol

f) Intake air temperature, 52±3 degrees Centigrade (125±5 degrees Fahrenheit)

g) Temperature of the heated mixtures, 104.4±1 degree Centigrade (220±2 degrees Fahrenheit)

i) Oil MS (GOST 1013-41)

j) Crankcase oil pressure, 4.2±0.7 kilograms per square centimeter (60±10 [Russian] pounds per square [Russian] inch

k) Carburetor adjustment: To obtain maximum thermocouple reading

l) Potentiometer adjustment, zero reading

m) Standard temperature is established for pure benzene and a mixture of 87 percent isooctane plus 13 percent normal heptane.

n) The humidity of the intake air during the test must be within 3.5-7 grams of water vapor per 1 kilogram of dry air (from 25-50 grains of water vapor per Russian pound of dry air).

o) Compression, variable

6. The micrometer adjustment is checked by pouring 140±0.5 milliliters of water into the combustion chamber, through the thermocouple opening. The water should rise to the upper level of the opening with the valves closed and piston at top dead center, a position corresponding to

the beginning of the working cycle. In this position, the compression micrometer must indicate 0.5 inches which corresponds to a compression ratio of 5.5:1.

7. <u>Construction of the Standard Temperature Lines</u>

Thermocouple readings, by means of which octane ratings are judged, differ for fuels with different detonation stabilities, and are determined by the lines of standard temperatures. These lines are constructed in this manner:

a) First the engine is warmed up. Then pure benzene is poured into one of the carburetor fuel compartments and a mixture containing 87 percent isooctane and 13 percent normal heptane into the other. For a given compression ratio a maximum reading of the thermocouple is obtained for each fuel.

b) The mixture composition is maintained for a maximum temperature reading, and the ratio of compression is then varied until the thermocouple reading is identical for both fuels. The ratio of compression thus achieved determines one point on the line of standard temperatures, the point of equal temperature of benzene and the 87 percent octane mixture.

This point of equal temperature is determined on the basis of no less than 3 trials for each fuel, trial results being averaged for each fuel.

In determining the point of equal temperature the discrepancy between average temperatures, employing benzene and the isooctane mixture, must not exceed 1 degree Centigrade (2 degrees Fahrenheit).

<u>Note:</u> Since the variation of compression - necessary in arriving at the equal temperature point - is apt to cause a change in mixture composition at the maximum temperature,

the following procedure is recommended:

1) Maintaining the preliminary adjustment of the mixture composition for maximum temperature (subparagraph 'a') compression is varied until equal temperatures are obtained for both fuels.

2) For a given compression, the mixture is adjusted for maximum temperature, and in case of necessity, compression is determined once again.

c) Without changing the mixture composition, and working with benzene, compression is decreased by 1 unit, and a temperature reading is taken.

d) The graph of figure 1 (Construction of the Standard Temperature Line) has compression ratios shown along the abscissa axis, and the thermocouple readings along the ordinate axis. Points 'a' and 'd' joined by a dashed line on figure 1 represent temperatures for two different compression ratios when working with benzene, and are labeled "the benzene line".

e) Point 'b' of the diagram is located at a temperature equal to that of point 'd', plus $\frac{1}{4}$ of the temperature difference between points 'a' and 'd', for a compression ratio equal to that of point 'd'.

f) Straight ~~line above~~, drawn through the point 'a' of equal temperatures of benzene and the mixture of calibrating fuels of 87 octane, and point 'b', is called the line of standard temperatures, by means of which a determination of the detonation [redacted] stability of fuels is made. This construction is clearly shown on figure 1, appended.

The standard temperature line must be determined daily before tests.

For this daily determination a mixture of secondary calibrating fuels calibrated against the primary calibrating fuels can be used, the primary fuels having an octane rating of 87 as determined by the motor process.

6. Regulation of the Mixture Content for Maximum Temperature

Regulation of mixture content for maximum temperature is effected by changing the mixture-levels in ■ carburetor fuel compartments containing the tested fuel and the mixture of calibrating fuels, respectively.

a) Under given test conditions, the trend of this regulation corresponding to temperature increase is determined, and the mixture content is varied until the thermocouple reading is a maximum. The fuel level at this point is noted.

b) Having established the fuel level for maximum temperature, the mixture is then enriched, its level being raised consecutively by 1 graduation of the measuring graduated glass-scale. The temperature reading corresponding to each fuel level is noted. This enrichment of the fuel mixture is continued until the temperature has fallen at least 9 degrees Fahrenheit (5 degrees Centigrade).

c) The fuel level is again set for maximum temperature, and the procedure of subparagraph (b) is repeated, while lowering the fuel level. This lowering is continued until the temperature has fallen at least 9 degrees Fahrenheit (5 degrees Centigrade).

d) The fuel level is again set by means of the graduated scale to an average level corresponding to the maximum temperature readings obtained heretofore, and this level corresponds to the optimum mixture composition to give maximum temperature.

This fuel level must be further checked. To do this, temperature readings are again taken for fuel levels 1 graduation higher and lower than the one found. If for one of these new levels, a temperature in excess of the one found above is read, the entire regulation was performed erroneously, and the whole process must be repeated.

Before recording the readings allow time enough for the temperature to become stabilized.

The fuel level corresponding to the maximum temperature must lie between the 0.8-1.8 graduations of the glass-scale. For certain fuels, fulfillment of this condition might require a change in the nozzle diameter. However, if this condition cannot be met when working with the primary calibrating fuels, the fuel system is probably clogged.

IV. STARTING AND STOPPING OF THE ENGINE

9. Starting Preparations

a) Oil (about 4 liters) is poured into the crankcase as far as the upper edge of the peep window, and the electric oil heater turned on.

b) Ethylene glycol is poured into the cylinder jacket to a level of 20 millimeters from the bottom edge of the peep window.

c) Fuel is poured into one of the carburetor compartments to warm up the engine.

d) The water petcock of the condenser coil is opened to make sure that water circulates through the coil.

10. Starting the Engine

After the engine is started and the crankcase oil temperature reaches 45-50 degrees Centigrade, proceed as follows:

a) Turn on the motor-generator

b) Turn on the ignition

c) Connect the feed-line

11. Stopping the Engine

Stop the engine as follows:

a) Disconnect the fuel feed-line

b) Turn off the ignition

c) Disconnect the electric switches

V. CONDUCT OF THE TEST

12. The test is comprised of the following operations:

a) Attainment of average experimental conditions working with the tested fuel.

b) Comparison of the tested fuel with the calibrating fuels.

13. Attainment of Average Experimental Conditions with the Tested Fuel

a) With the engine warmed up, a compression ratio is first established somewhat below that at which the standard temperature is expected. Then switch the engine to the tested fuel.

b) The mixture is then roughly regulated for maximum temperature, and the compression controlled so that the temperature is somewhat below the standard temperature.

c) The mixture then is regulated for maximum temperature according to paragraph 8.

d) Compression is finally regulated so that the thermocouple reading does not differ by more than 2 degrees Fahrenheit (1 degree Centigrade) from the standard temperature, corresponding to the given compression ratio.

For the determined compression ratio, the comparison of the tested fuel with a mixture of the calibrating fuels is then made.

14. <u>Comparison of the Tested Fuel with the Mixture of Calibrating Fuels</u>

This comparison is effected as follows:

a) Without changing the compression established for the tested fuel, two mixtures of calibrating fuels are poured into the empty fuel compartments. The mixtures are so chosen as to give one large and one small reading of the thermocouple respectively, compared to that obtained with the tested fuel.

Regulation of the mixtures for maximum temperature is conducted separately for each mixture.

b) Having picked two compositions of calibrating fuels, between which lies the tested fuel, the engine is switched alternately to the tested fuels and the calibrating mixtures. Take at least three temperature readings for each fuel. After each switchover, allow time for the temperature to stabilize itself before making a reading.

c) Once the average-temperature readings for all the fuels is obtained, the composition of the calibrating fuel mixture (having an detonation [redacted] stability equivalent to that of the tested fuel) is then given by the formula:

$$B_3 = B_1 \quad \frac{B_2 - B_1}{t_1 - t_2}(t_1 - t_2),$$

<u>Where:</u> B_1 — percentage composition of the less explosive calibrating fuel in the calibrating fuel mixture, the mixture being <u>more</u> explosive than the tested fuel;

B_2 — same as B_1 for a mixture <u>less</u> explosive than the tested fuel;

B_3 — same as B_1 and B_2 for an equivalent mixture;

t_1, t_2 and t_3 — temperatures for respective fuels.

In cases when the tested fuel is compared with isooctane containing various admixtures of R-9, the R-9 content of the equivalent mixture is computed by the same formula, considering B to indicate R-9 content of the fuel.

d) The octane rating of the fuel is found from the computed mixture and the transfer scale.

This rating must be determined within an accuracy of 0.1 octane unit.

e) Stir the mixture of calibrating fuels thoroughly before pouring it into the fuel tanks and first pre-rinse the piping with the same fuel.

f) During the test, check the engine condition by turning off the ignition. Combustion should then cease instantly, in both the case of the tested fuel and the calibrating mixtures.

Occurrence of flashes with the ignition off indicates engine defects. The test should of course be stopped until such a condition is corrected. Cause of these defects is due to: Carbon formation in the cylinder, or to lead deposits on sparkplug electrodes.

VI. CONSTRUCTION OF THE TRANSFER SCALE

15. In order to construct a transfer-scale from secondary to primary calibrating fuels, tests in paragraphs 12-14 are performed.

In constructing this scale, primary calibrating fuels are used as test fuels along with corresponding equivalent mixtures of secondary calibrating fuels.

When comparing the individual calibrating fuels (extreme points of the scale) with the primary calibrating fuels, the secondary calibrating fuel serves as a test fuel.

A primary calibrating fuel mixture is made up by volume, while the secondary is made up by weight.

16. Relationship between the primary and secondary calibrating fuels is represented by a graph, the abscissa of which represents the percentage of a secondary calibrating fuel in mixture with another, and the ordinate represents corresponding percentages of isooctane in mixture with normal

heptane (octane rating). The sample graph of the transfer-scale is shown on figure 2 (Sample Transfer Scale from Secondary to Primary Calibrating Fuels). For isooctane with R-9 a separate graph is shown, figure 3, appended.

The rating difference between two mixtures of secondary calibrating fuels for octane ratings less than 100 should not exceed 2 octane units, and for those with octane ratings in excess of 100, the difference should not exceed 10 percent of the content of one calibrating fuel in mixture with the other.

In using the scale for "Isooctane + R-9", the difference between two calibrating fuels should be as follows:

EQUIVALENTS OF ISOOCTANE R-9 MILLILITER PER KILOGRAM	DIFFERENCE BETWEEN CALIBRATING FUELS ACCORDING TO R-9 CONTENT IN MILLILITERS PER KILOGRAM
Up to 0.5	0.2
From 0.5 to 1.0	0.4
From 1.0 to 1.5	0.5
From 1.5 to 3.0	1.0
In excess of 3.0	1.5

17. The transfer-scale must be constructed for each individual engine. To construct this scale at least 4 points are needed involving the 3B-70 and 90 percent, 95 percent and 100 percent isooctanes in mixture with primary calibrating fuels.

18. A check of the scale ~~against primary~~ calibrating fuels should be made after overhauling and cleaning carbon from the engine, after checking the temperature-measuring devices, and upon changing secondary calibrating fuels. When checking the scale, examination of the two extreme points is usually sufficient.

Discrepancy in the checkpoints should not exceed 0.5 octane unit on the corresponding points of the scale. For greater discrepancies, the engine and the measuring instruments should be inspected, and the scale taken off again.

VII. PERMISSIBLE DISCREPANCIES BETWEEN PARALLEL DETERMINATIONS

19. For a given engine and fuel, the discrepancies between parallel determinations of octane rating should not differ more than +0.5 octane unit from the average result of the tests.

20. For tests conducted in different laboratories, this discrepancy should not differ by more than 1 octane unit from the arithmetic mean of the tests.

Description of the Apparatus

In the determination of octane ratings, a CFR Waukesha) [redacted] aviation method 1-C installation shown on figure 4 is used.

FIGURE 4. General [redacted] View of the Installation

1 - Micromax Potentiometer
2 - Air intake pipe
3 - Air heating tank
4 - Electric air heater
5 - Air thermometer
6 - Water inlet to the condenser
7 - An opening for the cooling liquid provided with a cork
8 - Thermocouple
9 - Compression micrometer
10 - Crankcase
11 - Crankcase oil intake pipe
12 - Light glass to observe the crankcase oil level
13 - Crankcase oil drain opening
14 - Cylinder tightening handle
15 - Oil filter
16 - Oil cooling water jacket
17 - Water outlet from the oil radiator
18 - Air-conditioning freezing column

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1. The Engine

A four-cycle one cylinder internal combustion engine with a variable compression ratio from 4 to 10 is used. The cylinder and the cylinder head are cast in one piece. Compression is varied by means of a worm gear mechanism and the cylinder is pressed upward by four springs. The piston is made of aluminum with five rings, of which the three upper ones are compression rings and the lower two are oil rings. The upper valves are of the suspension type. Valves are faced with stellite. The crankcase is made of cast iron with two piston counterbalances. (It is permissible to use the crankcase used in the motor method, GOST 511-41. In this event two ventilated openings, 12.7 millimeters or 0.5 inch in diameter, are to be drilled in the crankcase wall on the side of the transmission pinion gear and above the oil level. These openings are necessary in order to equalize pressure between the pinion gear box and the crankcase.) Size and construction of the engine are similar to those of the engine used for testing of fuels by the motor method (GOST 511-41). Ignition is effected by means of air induction coil, of which the primary current is supplied by a 110-volt, 220-watt DC generator contained in the installation, or by a magneto. Spark advance is indicated by a neon tube placed inside a rotating hard rubber disk on the crankshaft.

Starting and braking of the engine is effected by a short-circuited synchronous electric motor, 220/380 volts, 50 cycles, connected to the engine by means of a belt transmission. This motor starts the engine, and during operation brakes the engine and keeps it going at a constant number of revolutions per minute (1200 ± 12). The cylinder cooling is of the thermosiphonic evaporator type, and ethylene glycol is the cooling liquid.

Lubrication of the engine is effected by a pressure pump, located in the crankcase and delivering oil to the main and connecting rod bearings, floating piston pin and the camshaft.

To cool and filter the crankcase oil, the oil filter and water radiator are installed on the base plate.

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The following are the engine dimensions:

	A LOW RPM ENGINE WITH CRANKCASE	A HIGH RPM ENGINE WITH CRANKCASE
Diameter of the cylinder (inches)	3.25	3.25
Length of piston stroke (inches)	4.5	4.5
Cylinder displacement (milliliters)	0.612	0.612
Valve diameter (inches)	1.187	1.187
Connecting rod bearing diameter (inches)	2.23	2.25
Connecting rod bearing length (inches)	1.625	1.625
Front main bearing diameter (inches)	2.25	2.25
Front main bearing length (inches)	2.00	2.00
Rear main bearing diameter (inches)	2.25	2.25
Rear main bearing length (inches)	4.25	4.90
Piston pin diameter (inches)	1.25	1.25
Distance between connecting rod centers (inches)	10.00	10.00
Transmission pinion gear width (inches)	1.00	1.00
Number of piston rings	5	5
Diameter of exhaust pipe (inches)	1.25	1.25
Sparkplug diameter (inches) [S.A.E. standard is 18 mm.]	18	18 [sic]
Approximate weight of engine (kilograms)	300	350
Approximate weight of installation (kilograms)	850	1000

2. Carburetor

The carburetor has three separate float[redacted] chambers with three fuel tanks. Each floating chamber has its own fuel spraying nozzle and a graduated glass scale for marking the level.

Turning a screw attachment lowers and raises the fuel tank and controls the level (mixture content). Switchover of the fuel tanks is effected by a three-way petcock. Such carburetor construction allows the engine to run on various fuels without first shutting it off.

The carburetor has a horizontal jet and diffusor with a diameter of 19 ± 0.025 millimeters (0.75 ± 0.001 inches).

Mixture content is regulated separately for each float [redacted] chamber, while the fuel level is determined by the nozzle diameter.

No standard throttling valve is used.

A heat insulating metallic screen is inserted between the carburetor and the heater for the mixture. A special 19 millimeter copper-asbestos gasket is placed between the screen and the intake pipe, and a similar standard gasket between the carburetor and the screen.

An electric heater for the mixture is located on the intake line between the carburetor and the cylinder. The heater is placed in such a way that the opening between the plates comes opposite the carburetor intake pipe, the end of the plates being from 3-6 millimeters below the center of the carburetor outlet pipe. The mixture thermometer must be so inserted that the mercury bulb is centered in the carburetor intake pipe 4.75 ± 0.25 millimeters away from the central axis of the vertical portion of the intake pipe and 0.8 ± 0.25 millimeters away from the outlet pipe flange.

3. The Intake System

The intake air must have its humidity controlled (paragraph 5). To obtain this control, the installation is equipped with an ice column.

The ice column consists of a zinc reservoir 2.4 by 0.4 meters, made of sheet iron, and having a layer of asbestos insulation 63.5 millimeters thick.

Inside the column, 102 millimeters from the bottom, is placed a wire mesh having 12.5-millimeter openings. The mesh is covered with a layer of ice at least 450 millimeters high.

The ice column communicates with the carburetor through a pipe and an equalizing tank. The air enters the engine as follows:

External air is admitted into the ice column through an opening in the ice-chamber cover. The ice-filtered air then passes through a 67 millimeter pipe located within the ice layers, becomes cooled to about 0 degrees Centigrade, and saturated with 3.5-4 grams of water vapor per kilogram of dry air. Next the air is admitted into the equalizing air tank, warmed to 52 degrees Centigrade and finally drawn into the carburetor.

The air now becomes mixed with fuel and heated to 104 degrees Centigrade before passing from the carburetor into the engine. The ice column is loaded with ice cubes, about 50 millimeters on a side. Larger pieces of ice will form too free air channels, while smaller pieces will impede the delivery of air to the engine.

Construction of the ice-column permits replenishment of ice without stopping the engine, the melted ice in the column being removed through a drain.

> Note: If the humidity of the air during the tests is between 3.5-7 grams of water vapor per 1 kilogram of dry air, use of the ice column is not mandatory.

4. Measuring Apparatus

Apparatus for measuring detonation [redacted] force are the thermocouple and the potentiometer.

The thermocouple is made of ferro-constantan alloy (type 15-C5-2A), and is screwed into the cylinder head.

The thermocouple is connected to the micromax potentiometer, which indicates thermocouple temperatures in degrees Fahrenheit.

The apparatus must be accurate within 2 degrees Fahrenheit (1.1 degree Centigrade).

5. Regulation of the Engine and Apparatus

(a) Ignition interrupter gap - 0.635 millimeters (0.025 inches)

(b) Sparkplug electrode gap - 0.01-0.025 inches (0.25-0.635 millimeters)

(c) Sparkplug make - R1-11-64A Champion with internal electrodes

(d) Valve clearances for a cold engine should be:

Intake valve - 0.2 millimeters (0.008 inches)

Exhaust valve - 0.25 millimeters (0.01 inches)

(e) Phases of distribution:

When checking valve overlap, both valve clearances should be 0.25 millimeters, and the following overlap set:

Intake valve opens	=	10 degrees past top dead center
Intake valve closes	-	34 degrees past top dead center
Exhaust valve opens	-	40 degrees before bottom dead center
Exhaust valve closes	-	15 degrees past bottom dead center

6. Maintenance of the Engine and Apparatus

1) Daily Maintenance

(a) Prior to operation, check the clearances and condition of valves, sparkplug and the ignition interrupter.

Should foreign deposits be found on the contacts of the interrupter, scrape them off, or replace the contacts.

During sparkplug inspection, pay particular attention to the condition of the porcelain and to the deposits of lead. Lead must be scraped off; the sparkplug should be replaced if cracks are found in the porcelain.

(b) Carbon must be cleaned off the lower end of the sparkplug.

(c) Tappet rocker arms are to be lubricated and the valve oil cups filled with crankcase oil.

(d) Test the compression by turning over the engine flywheel by hand.

(e) Fuel tank filters are to be inspected and, if necessary, cleaned with gasoline or benzene and blown out with compressed air.

(f) Upon shutting down the engine, the crankshaft is to be so turned that both valves are closed.

(g) Empty the fuel tanks.

2) Periodic Maintenance

(a) The engine should be overhauled and carbon removed from the cylinder head, piston and valves after every 100 hours of operation at least, sometimes oftener, depending on the general operating stability of the engine judged by erroneous discrepancies in the thermocouple readings.

<u>Note:</u> Erroneous thermocouple readings could be due to the deterioration of the dry cell that feeds current to the potentiometer. In this case, replace the dry element.

(b) In overhauling the engine, carbon must be removed from the rings, piston and valves. The cylinder interior must be examined closely and the cylinder mirror thoroughly cleaned.

Cylinder wall wear of 0.15 millimeters, conicity of 0.1 millimeters or ellipticity of 0.06 millimeters requires replacement or reboring of the cylinder.

(c) Clearances between the valve stems and valve guides should be: 0.063 ± 0.012 millimeters for the intake valve and 0.09 ± 0.012 millimeters for the exhaust valve.

Valve guides should be replaced when the upper limit of clearance exceeds 0.025 millimeters.

Carbon must also be chipped off the valve guides when the engine is torn down.

(d) Upon reassembling the engine, pour kerosine on the valves to check reseating.

(e) After the engine has been assembled, run it for at least four hours, beginning with a low compression that is gradually increased.

(f) The crankcase oil is to be changed after 30 hours of engine operation.

(g) The sparkplug is changed after 100 hours of operation and oftener depending on its condition.

(h) The cooling system must be cleaned and washed out frequently.

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Proposed by the Ministry of Petroleum Industry of the Eastern Regions USSR

Approved by the All-Union Committee on Standards, 15 November 1946

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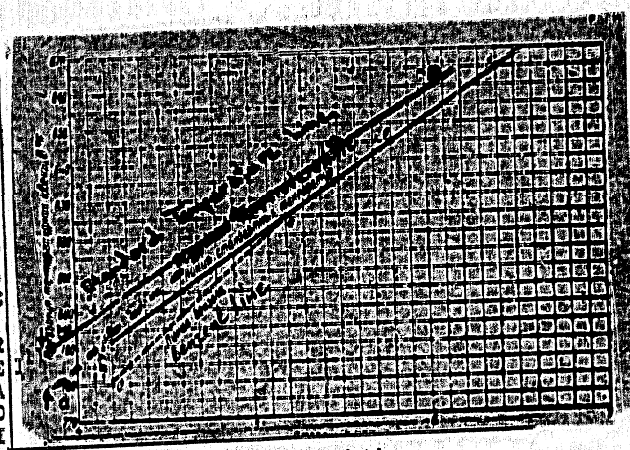
FIGURES AND GRAPHS

Figure 1: Construction of the Standard Temperature Line



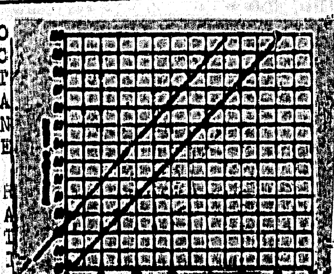
a - point of equal temperatures of benzene,
and the 87 octane mixture of calibrating fuels

b - point on the standard temperature line

c and g - points of the tested fuels

d - second benzene point

Figure 2: Sample Transfer Scale from Secondary to Primary Calibrating Fuels



FIGURES AND GRAPHS

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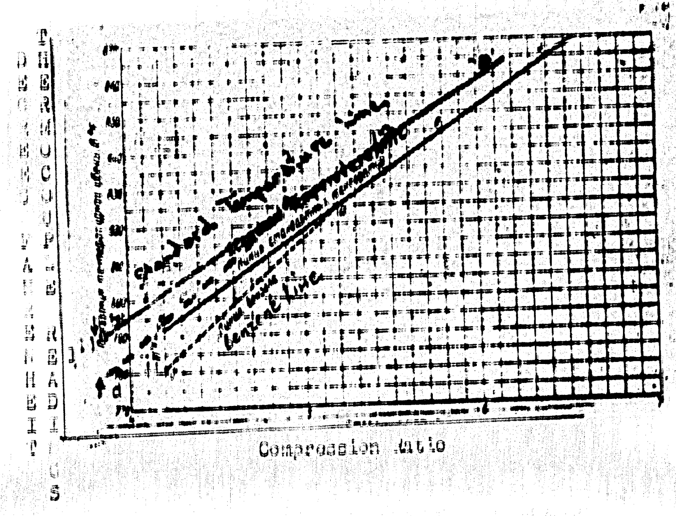

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